



Toward a Political Ecology of Migration: Land, Labor Migration, and Climate Change in Northwestern Nicaragua



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SUMMARY

Smallholder labor migration and its relationship to climate change adaptation has received increasing attention, with migration often represented either as part of successful adaptive livelihood diversification or as symptomatic of a lack of in-place adaptive capacity. Using a case study, we focus on the relationship between labor migration, agrarian livelihood diversification, and climate change to further a more nuanced understanding of “migration as adaptation” than is implied by a simple dichotomy of success versus failure. Smallholder diversification, both on- and off-farm, has largely been framed as a risk-spreading practice that lowers climate change vulnerability. But after decades of advocating livelihood diversification, with labor migration now increasingly a part of smallholder livelihood activities, it is urgent to pose a number of questions: Why do smallholders migrate? How does labor migration unfold for them and with what outcomes? Our primary goal here is to explore the nature of the relationship of labor migration to climate change and climate change adaptation. Through empirical fieldwork in northwestern Nicaragua, we explore the role of labor migration in smallholder household production and reproduction, as families confront increasingly difficult climatic conditions for agricultural production and a relative absence of the state within a neoliberal political economy. Our analysis draws on household surveys and qualitative interviews and focus groups we carried out in the municipality of Somotillo, in northwestern Nicaragua, over three years (2013–15). Our findings demonstrate that household labor migration neither facilitates adaptation to climate change nor reflects a failure to adapt, but rather reflects the weak position of smallholders in interlocking relations of power and the relative land scarcity experienced by many. We argue that labor migration barely maintains semi-subsistence agricultural production and reinforces existing social inequalities, raising questions regarding a conceptualization of “migration as adaptation” and the benefits of this type of livelihood diversification.

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1. Introduction

Scholarship on the relationship of smallholder labor migration to climate change and climate change adaptation depicts migration as either adaptation to climate change, often via the mechanism of livelihood diversification, or as a failure of in-place adaptive capacity (Gemenne, 2013; Tacoli, 2009; Warner, 2009; Zoomers, 2012). This literature thereby conceptualizes labor migration as outside of, or separate from, farming systems. In this paper, we contend that the relationship between labor migration and climate change adaptation is more complex than the aforementioned dichotomy implies, because labor migration can be an integral part of smallholder farming systems. In the context of an empirical case study from northwestern Nicaragua, exhibiting both climate changes and international labor migration, we pose a number of questions

necessary for understanding the relationship of labor migration to climate change and climate change adaptation: Why do families here engage in labor migration? Are they migrating in response to a changing climate? How does this labor migration unfold and with what outcomes? Is their migration best understood as climate change adaptation or not?

In this Nicaraguan case study, specifically, we explore the role of international, largely south–south, labor migration in smallholder household production/reproduction. We argue that families (and family members) confront a relative absence of the state and land scarcity, within a neoliberal agrarian context, along with increasingly difficult climatic conditions for agricultural production. With this article, we contribute to a reorientation of research on labor migration and climate change, breaking the dichotomy of migration as climate change adaptation or not, and arguing for a

political ecology of migration. A political ecology of migration places specific emphasis on the role of the political economy, and on natural resource access and rights, in explanations for migration, and adds an analysis of structure to an otherwise unbalanced focus on smallholder agency (or lack thereof, with climate instead as deterministic).

Nicaragua, with its 6.014 million people (2014), is one of Latin America's least developed countries.¹ Forty-six percent of the population lives below the poverty line, and 15% live in extreme poverty (USAID, 2011). In rural areas, the 68% incidence of poverty is more than double that in urban areas (29%). Rural poverty is associated with no or little access to land (Broegaard, 2009), and land distribution in Nicaragua today is greatly skewed, with 9% of landowners controlling 56% of the farmland, while 61% of the smallest farmers (smallholders) hold only 9% (USAID, 2011). In addition, 38% of the rural population is landless (USAID, 2011), although the landless often also engage in farming. Unequal land distribution and access is not new in Nicaragua's tumultuous political history and was a major cause for the Sandinista revolution in 1979 (Everingham, 2001). Despite various efforts over the last two and half decades to address poverty and inequality, Nicaragua remains a highly inequitable economy, with the lowest 20% of the population holding less than 4% of national income (USAID, 2011). In rural areas, migration was often the only way to survive during the 1980's Contra War, as farming was dangerous and many people left the countryside. Now remittances from Nicaraguans living abroad are estimated to supplement the incomes of 40% of Nicaraguan households, with over US \$1 billion flowing into the country in 2008 (USAID, 2011).

This context of poverty and inequality is made worse by the vulnerability of large segments of the poor population to climate variability and extreme, often large-scale, weather events. According to the Global Climate Risk Index 2017 (for the period 1996–2015), Nicaragua was the country fourth most affected in the world by meteorological events of all kinds, such as storms, floods, heat waves, and droughts. From 1996 to 2015, around 160 people died directly due to these events, with annual average deaths of 2.94 for every 100,000 people, but this statistic hides a much larger, widespread effect on people's lives. Nicaragua also lost around 235 million dollars as a consequence of 44 extreme meteorological events (Kreft, Eckstein, & Melchior, 2016). Climate change is increasing the incidence of these extreme events. For example, during the last 33 years there has been an increase in the occurrence of hurricanes in the country, as well as an increase in hurricane intensity (Araúz, Araúz, Navarro, & Martínez, 2011). In addition, average temperature and precipitation patterns are changing. The west of Nicaragua, where (from 1971 to 2000) the average maximum temperature was 34.6 °C and individual maximum values could reach up to 40.2 °C (INETER, 2007), now is experiencing maximum values up to 42 °C (Araúz et al., 2011). Along the Pacific coast, some meteorological stations have registered a decrease in precipitation between 6% and 10%. The vulnerability of agriculture to climate change is well-documented (Parry, Carter, & Konijn, 1988; Reilly & Schimmelpfennig, 1999). Precipitation, evaporation, and temperature have marked effects on agricultural productivity (Adams, Hurd, Lenhart, & Leary, 1998; Rosenberg, 1992).

Thus, the consequences of climate change are likely to affect agricultural productivity and smallholder welfare (Adams et al., 1998; Mendelsohn & Schlesinger, 1999). Nicaragua is highly dependent on maize and bean production (among other crops) to feed its population, much of this produced by smallholders, and these crops are anticipated to experience severe losses due to climate change (Gourdji, Läderach, Valle, & Martinez, 2015; Ramírez, Ordaz, Mora, Acosta, & Serna, 2010). Smallholders in

Nicaragua confront this changing climate, at the same time that they face a marginal position within the global political economy. This “double exposure” (Leichenko & O'Brien, 2008) produces an interlocking set of vulnerabilities spread unevenly across the country and across different kinds of farmers. The political-economic “exposures” most saliently include, since the 1990s, a shift by the Nicaraguan state to neoliberal policies for the agrarian sector (Deere & Leon, 2001). Here, neoliberalism has been characterized by a prioritization of agro-exports, accompanied by the increasing presence of foreign capital (Puig, 2016),² land privatization and titling (Baumeister, 2011; Broegaard, 2009), and the elimination of agricultural subsidies in accordance with a free-market ideology. For the country's smallholders and rural landless, the results have been a decline in extension services, decreasing access to affordable credit, and a re-concentration of land (Baumeister, 2011; Boucher, Barham, & Carter, 2005). Due to the observed and expected changes in climate across Nicaragua, the state has started articulating national strategies for climate change mitigation and adaptation (Ministerio Agropecuario y Forestal, 2013). However, these strategies have not yet translated into specific policy changes and state-sponsored programs with material effects at the local level.

We first turn to a review of the literature, focusing on the dual topics of (1) how labor migration has been framed in relation to climate change and climate change adaptation and, (2) how labor migration has been framed in relation to livelihood diversification (and therefore resilience and adaptation). In this section, we argue for the formation of a political ecology of migration. We then detail our research methods, followed by combined results and discussion on (1) the key factors leading to labor migration that emerge from our fieldwork and analysis, (2) the nature of the observed migration, (3) its outcomes, and (4) the way that this migration functions as livelihood diversification or not, and as climate change adaptation or not. We demonstrate that migration occurs in conjunction with land-based household strategies, all of which are carried out in the absence of comprehensive state approaches to improving livelihood options and alleviating poverty and hunger in the area. As such, labor migration largely is *part of* the smallholders' farming system, substituting for the absent neoliberal state. We demonstrate that this migration neither facilitates adaptation to climate change nor reflects a failure to adapt, but rather reflects the weak position of smallholders in interlocking relations of power and the relative land scarcity experienced by many. In turn, this migration maintains a semi-subsistence farming system that inadequately feeds families and reinforces existing social inequalities.

2. Toward a political ecology of migration

(a) Labor migration as climate change adaptation success or failure?

In considering the relationship between climate change and migration, many scholars depict migration as the result of people failing to adapt in-place to a changing (worsening) environment or as a response to a single environmental hazard event—e.g., migration as a response to increasing drought frequency, and the inability to adapt agricultural systems to this situation, or as a response to a devastating drought or hurricane (see reviews by Gemenne, 2013; Tacoli, 2009; Warner, 2009; Zoomers, 2012). This type of migration is sometimes referred to as “forced migration” in the literature (Brown, 2007; Piguet, 2008; Warner, Hamza, Oliver-Smith, Renaud, & Julca, 2010), conceptualizing individuals and

¹ <http://data.worldbank.org/country/nicaragua>.

² The prioritization of the agro-export sector and larger scale commercial ventures occurred during Nicaragua's Revolutionary Period, but increased during subsequent decades (Puig, 2016; for a complete discussion of the political economic history of Nicaragua since 1979, see Close, Puig, & McConnell (2011)).

families as forced to migrate because their poverty and poor education/skills mean they have little adaptive capacity, leading to their failure to adapt and their inability to remain successfully at home. This research has fed into a dramatically expanding discourse of climate change refugees in the last decade, with public concerns growing in the global North at the prospect of increased migrant flows from the “poor” global South. Much public-policy-oriented scholarship embodies a sense of the inevitability of climate refugees (see, e.g., Ferris, 2015) and calls for preparation (Werz & Hoffman, 2015). This latter policy literature approaches migration as a problem to be solved and does not really consider its underlying drivers/causes. The literature also tends to focus on singular motivations for migration (for example, climate change). Indeed, research in migration studies has established that migration is rarely the result of a single cause, rather it is a complex process shaped by multiple social, political, economic, and spatial drivers (Castles & Miller, 2009; Massey et al., 1993).

However, a number of scholars critique the emergence of this climate refugee discourse at the end of the 20th century (e.g., Morrissey, 2012; Piguet, 2013) and characterize this literature as apolitical and ahistorical. Morrissey (2012) argues that we need more research on the historically and contextually specific relationship between migration and environmental stress or change and calls for research that critically examines when and why migration does or does not emerge as a response. Some empirical studies have done so, successfully questioning the inevitability of a migration response (Gray & Mueller, 2012a; Paul, 2005) and demonstrating, for example, that there are often heavy barriers to migration (Gray & Mueller, 2012b). Black, Arnell, Adger, Thomas, and Geddes (2013) therefore stress the need to consider three classes of outcomes following extreme environmental events—migration, displacement, and immobility. Many scholars working from this perspective frame migration as a response to a multitude of different potential drivers (see e.g., Black, Adger, et al., 2011). However, often this research still does not satisfactorily address the challenge to situate “environmental” migration in political and historical terms.

This latter perspective connects to a line of research pointing out the role that migration can play in coping with or adapting to environmental hazards or conditions (e.g., Wilk & Kgathi, 2007). For example, Lein’s study (2009) of residents of riverine settlements in Bangladesh illustrates the role of local migration as an adaptation to a constantly changing riverine environment. Here, mobility is an adaptation of livelihoods to challenging or cyclically changing environments. In contrast, Bardsley and Hugo (2010) consider migration as an effective adaptation response to climate change impacts that surpass place-specific thresholds, positing a non-linear migration response of individuals and households to changing environmental conditions. Many of these scholars frame migration in terms of livelihood diversification and adaptation, in a context of livelihood stresses, but with migration decisions mediated by behavioral, institutional, and social factors (e.g., Martin et al., 2014). The work of Black, Bennett, Thomas, and Beddington (2011) has pushed somewhat further and explicitly has attempted to shift the discourse from migration as a problem (representing the failure of adaptation) to migration and mobility as adaptations that might present positive opportunities for reducing climate change vulnerability. A recent review by Burnham and Ma (2016) proposes a typology of seven categories of climate change adaptation strategies by smallholder farmers, one category of which is labor migration, conceptualized as distinct from mobility strategies *in situ*.

(b) Labor migration as a diversification strategy

Diversification is often put forth as a strategy for climate change adaptation due to its potential role in spreading climate risk across

a wider set of livelihood activities that might be differentially impacted by a given weather event. However, whether labor migration may be conceived of as a diversification strategy is subject to debate in the literature. Ellis (1998, p. 1) defines “livelihood diversification as the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and to improve their standards of living.” In this conceptualization, labor migration can be considered one way that families diversify their collective livelihood portfolio. In contrast, in his now-classic articulation of a sustainable livelihoods framework, Scoones (1998) identified three different classes of livelihood strategies: agricultural intensification–extensification, diversification, and migration. Here, Scoones positions migration in a conceptually different location distinct from (presumably in-place) diversification. More recently, livelihood diversification studies most often frame labor migration as one specific type of diversification outside of agriculture. Weldegebriel and Prowse’s (2016) empirical study in Ethiopia exemplifies this approach: In their study, they understand international and national labor migration to be diversification outside of agriculture and therefore to be a climate change adaptation because, “it creates opportunities for accumulation as well as cushioning smallholders from losses due to climatic variability” (Weldegebriel & Prowse, 2016, p. 9).

Even if we do conceptualize labor migration as diversification, is livelihood diversification always beneficial for families and all its members? Certainly, research has demonstrated that diversification in the form of labor migration has its costs, often borne by different family members, and that labor migration can leave families worse off collectively even as the individual labor migrant benefits (Silver, 2014). In addition, in a recent study a group of researchers argue that diversification itself can trap smallholder families in semi-subsistence production systems and ultimately in poverty. In research in the Usumacinta Valley of eastern Chiapas, Mexico, examining linkages between changing livelihood strategies and land cover, Christman, Pearsall, Schmook, and Mardero (2015) found that smallholders often had to incorporate more crops into their agricultural portfolios and increase their off-farm activities in order to survive. The authors argue that for these small landholders, this led to an “atomization” of livelihood activities, with a loss of any potential scale efficiencies, in contrast to the ability of large landholders to pursue more specialized and lucrative agricultural opportunities for the market. In that Mexican case, livelihood diversification reflects limited access to land and maintains these producers’ semi-subsistence status. As such, arguably, this type of livelihood diversification (with “atomization”), in fact, can maintain social inequalities through the widening gap between capitalist farmers and so-called peasants. Furthermore, we argue that in some cases labor migration is not best conceptualized as diversification, but rather should be considered part of the agricultural system, as some farmers engage in labor migration largely to sustain traditional agricultural livelihoods (in the case presented here, for instance).

(c) Political ecology in explanations for migration

Whether migration is considered a valid strategy for adaptation to climate change, or whether it represents a failure of in-place adaptation, is part of a larger discussion of what often is termed environmental migration. In response to this literature and engaging with it, a number of scholars have brought the lens of political ecology to a more critical assessment of the role of environment as a cause of migration. This emerging literature considers migration within its historical and political context, with an emphasis on underlying structural explanations and a consideration of outcomes from a social justice perspective. Scholars influenced by political ecology consider environmental change or environmental

hazards as but one component in a more complex system (Black, Adger, et al., 2011), with multiple factors involved in the decision of whether and where to migrate. In this approach, migration reflects, in particular, political economy and power dynamics as well as environmental change.

Scholarship in this emerging body of literature has established the key role of power dynamics in shaping migration decision-making in response to environmental change (Carr, 2005); has demonstrated how inequalities in land access influence internal migration patterns (Carr, 2008); and has examined how the state's promotion of extractive development policies can also foment certain forms of migration (Barney, 2012). In an important contribution, Wrathall and colleagues (2014) use evidence from Honduras and Peru to argue that climate change stresses that limit people's access to resources such as land and water result in a migration that reflects and reinforces local power inequalities. According to these authors, "...political economy sets up migration as an increasingly viable adaptation alternative among a dwindling set of adaptive choices" (Wrathall et al., 2014, p. 294). Whether or not migration can be/should be considered an adaptation strategy, has been less considered in this literature. In what follows, we present a holistic view of the most salient political-economic and environmental factors that contribute to migration in our study area, and by so doing we further question the notion of migration as diversification and as climate change adaptation. We show that it is rather the weak political-economic position of smallholders and produced land scarcity that fosters migration. We stress the need to consider the structural constraints on smallholder agency.

3. Case-study methods

In this article, we focus on a single case study from the municipality of Somotillo, located in the department of Chinandega

(Figure 1). Somotillo sits on the border with Honduras and is 90 km away from one of Nicaragua's important regional economic centers, the city of Chinandega. Our research in Somotillo is part of a larger project to examine migration and environment interactions in Nicaragua and Guatemala. Somotillo was selected as a project case study due to its severe drought incidence, high vulnerability to climate change, and its high incidence of migration. We carried out research over a multi-year period during 2013–15 and combined qualitative methods, including in-depth interviews and focus groups, with quantitative household surveys.

We conducted household surveys with 120 households distributed in six communities, using a local team of survey enumerators to complete face-to-face interviews. Prior to drawing the survey sample, we conducted a census in each community in order to construct the sampling frame. Specifically, we visited all families living in the six communities to collect information on whether or not the household has (or had in the past) any members engaged in international labor migration. Then, to ensure sufficient sampling of households with migration, we oversampled for these households. The achieved sample stratification was approximately 70% migrant and 30% non-migrant. The sample was additionally stratified across the six communities selected for inclusion in the sample, with approximately 20 households drawn from each. In the municipality, communities generally tend to be in the range of 100–300 households in size, and we sampled roughly 10% of each community's households. The survey instrument consisted of multiple sections covering the household's demographic composition, agricultural activities, migration, and food provision and security. The primary interviewee was the adult member of the household first contacted by the survey team, when the team arrived at the house to establish willingness to participate. This approach resulted in 62 male respondents and 58 female respondents.

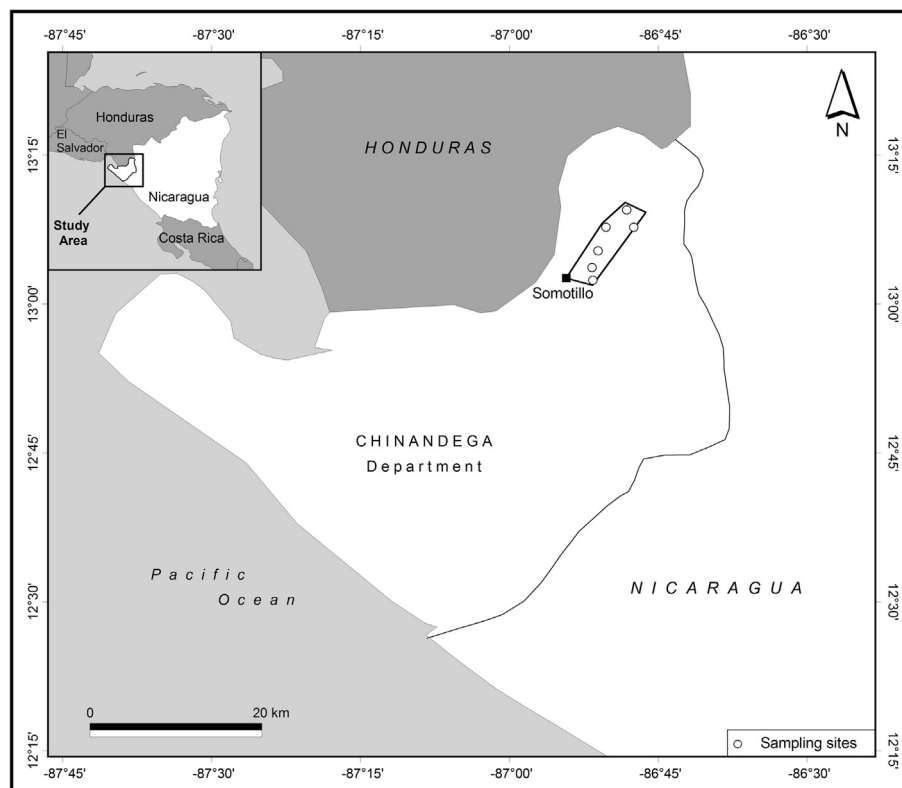


Figure 1. Case study in Somotillo, Chinandega, Nicaragua. (Source: adapted from Radel, Schmook, Carte, and Madero (2016)).

One of our team members (Carte) then conducted 20 qualitative interviews throughout the six selected communities (10 with men and 10 with women) in the summers of 2014 and 2015, along with two participatory community workshops—one with seven men and one with six women—in one single community. We conducted the two workshops in one community only, due to the similarities among selected communities, and the desire to deepen and broaden knowledge in one place. Participants for the qualitative interviews and workshops were largely drawn from the pool of survey respondents; however, we also identified additional key informants through word-of-mouth, for the qualitative interviews and workshops. We shaped qualitative interviews around a specific theme or themes, such as the interviewee's migration experience, eliciting more fine-grained qualitative information on this experience and the respondent's own perspectives and interpretations of it. These interviews ranged in duration from approximately 45 to 120 min. The workshops lasted approximately 2.5 h and were facilitated by Carte and a local research assistant. The interviews and workshops were audio recorded with the permission of respondents.

Quantitative household data analysis was done with SPSS, largely using basic descriptive statistics. Recordings from the qualitative interviews and workshops were transcribed and then iteratively coded for specific topics in conjunction with the quantitative analysis themes. For this article, interview transcriptions were coded for data on migration causes and outcomes, for impacts of environmental events or changes on agriculture and livelihoods, and for land access.

4. Results and discussion

(a) What factors lead to migration?

As argued by migration scholars and in the emerging literature in the political ecology of migration, labor migration processes are the result of a confluence of multi-scalar factors—some of which relate to political-economic structures. In the following section, we outline the three key factors, as identified during fieldwork, that contribute to international labor migration from our study area. These three key factors encompass the physical and political-economic environments and are (1) climate change as experienced locally, (2) the smallholder farming system, and (3) land tenure and land access.

(i) Climate change as experienced locally

Chinandega is part of the northwestern Pacific lowlands, with a tropical dry climate. The department of Chinandega experiences a dry season of five to eight months, with a mean annual precipitation of 1835 mm (INETER, 2007). The rainfall pattern is generally bimodal, with one short and one longer seasonal dry period. Somotillo has one of the lowest annual precipitation levels in the department. According to data from the network of meteorological stations of the Nicaraguan Institute of Territorial Studies, the average annual temperature in Somotillo is around 27.7 °C (INETER, 2007). These baseline conditions are forecast to change. According to an assessment of climate scenarios by De Loma-Ossorio, García Ruiz, Córdoba Salinas, and Ribalaygua Batalla (2014), under different climatic models, Somotillo is one of a series of municipalities in Nicaragua's Fonseca Gulf region predicted to experience an increase in maximum and minimum temperatures of between 1 and 2 °C (by the period 2041–71), especially during the middle months of the year. According to these same climate models, precipitation will decrease by approximately 10% during the June to August period—a key period for one of the cultivation cycles (see below)—with reductions of up to 18 mm average during this June to August period (de Loma-Ossorio et al., 2014).

To identify the already experienced precipitation and temperature trends in Somotillo, we used an available online tool (World Climate Analysis,³ developed by Duncan Golicher). This tool uses extrapolated satellite data from the University of Delaware's Global Climate Resource Pages⁴ (developed by Willmott and collaborators) to provide climatic information such as temperature and precipitation trends over the last 50 years, calculated under a linear model.⁵ By applying the World Climate Analysis tool, we found since 1960 Somotillo has experienced a mean annual precipitation fluctuating between 500 mm (minimum) and 1800 mm (maximum) (Figure 2). These data also indicate a cyclic behavior in precipitation over the years, alternating drier periods with wetter periods. Nevertheless, this cyclical pattern occurs within a clear and significant negative trend over the last 50 years. This trend reveals a statistically significant decrease of an average of 94.03 mm per decade ($p = 0.003$). Similarly, our analysis of the temperature data reveals a statistically significant increase in the average annual temperature of 0.38 °C per decade ($p = 0.000$) (Figure 2).

Our analysis suggests that it is both hotter and drier in Somotillo since the area was first settled in the 1940s and 1950s, which makes agricultural production much more difficult. In addition, warming and changing precipitation patterns are likely to continue into the future. Such trends we observe in the climate data are also reflected in local perceptions conveyed through our interviews with residents. Our study participants noted, in particular, the varied nature of the rains. For example, one male community leader and farmer explained:

We depend on the rainy seasons, but there are factors that are beyond us—there are rainy seasons that are too rainy, and others that are dry... This year what happened was that we had a rainy season where it rained, got hot, then got dry again, then started to rain again. There weren't heavy rains like other times, when it rains for five or six days and floods the crops and they're ruined. So, this is what we're dealing with, sometimes we do well, and other times we do poorly...

Workshop participants agreed that in the past, for example, during the 1960s and 70s (during the youth of several of the participants) the rains were more reliable. One middle-aged male participant said, "The rains were great back then, we didn't have [the problems] that we have now." Others expressed concern, citing their dependence on favorable rains as the key factor to their survival in agriculture in an area where irrigation technology is rarely available. Another male workshop participant explained, "Rain is the biggest problem we have here. We need it in order to cultivate..." Or as another male farmer emphasized: "It doesn't matter what the government gives us. They could give us loads of fertilizer, but how would that help us? They could give us tons of money so we can make agriculture work, but we would lose it all, we'd all go under!" Thus, our climate data analysis results and our interview data illustrate the reality of unpredictable, variable rains, as well as a growing concern over the increase in drought conditions and the subsequent negative impacts those conditions will have on local agricultural livelihoods.

(ii) The smallholder farming system

For Somotillo smallholders, agricultural production is critical to household livelihoods. Key crops include maize for food, sorghum

³ http://geoserv.ecosur.mx/apps/world_climate_analysis.html.

⁴ <http://climate.geog.udel.edu/~climate/>.

⁵ Linear models are the most common way to assess climate trends and represent changes in the mean state of the climate as a long-term linear change, providing an average of change (in this case, millimeters of rain and Celsius degrees increasing or decreasing by decade). Simple linear regression and the least-square method are the most commonly used to estimate trends (slope) for climatic variables, with a *t*-test for statistical significance.

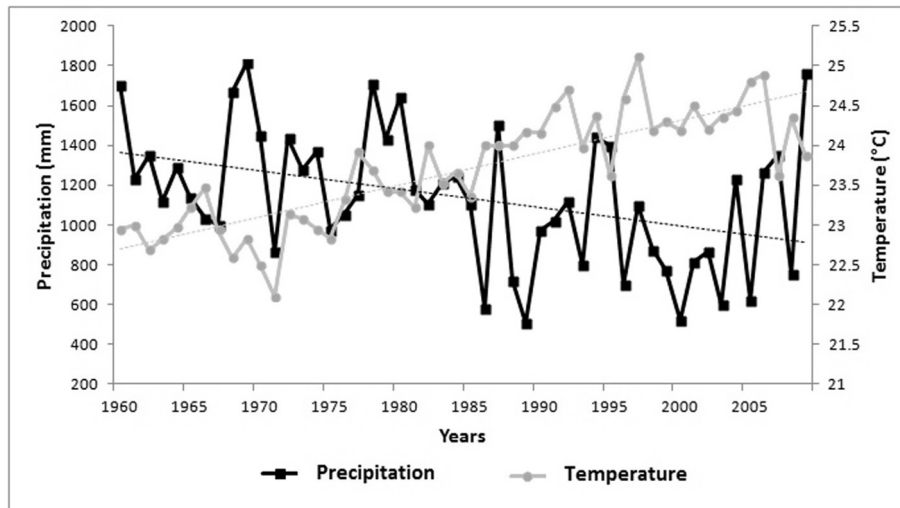


Figure 2. Annual precipitation and temperature measurements for Somotillo from 1960 to 2010. The solid lines are the annual measurements, and the dotted lines are the statistically fitted trends ($p = 0.003$ for precipitation; $p = 0.000$ for temperature). Data are the analysis results from the World Climate Analysis tool (http://geoserv.ecosur.mx/apps/world_climate_analysis.html), created by Duncan Golicher. Underlying data source: Center for Climate Research, University of Delaware.

for animal feed and for family food in times of scarcity, and sesame for the market. Some families with a little more land focus on cattle production. Many families have at least one or two cows for subsistence cheese production. In our household sample, 65% of households reported having a few heads of cattle and 87% of households reported planting crops. Planting occurs in two cultivation cycles (the *primera* and the *postrera*), with more households planting in the second, or *postrera*, cycle. Planting for the *primera* occurs in May or June, depending on the arrival of the rains. Harvest of maize occurs largely in August. Planting for the *postrera* begins in September and can extend over several months. It is during this period that farmers plant most of the sesame, in addition to maize and sorghum. Harvesting occurs in November and December. According to our survey, which measured reported seasonal availability of food at the household level using a monthly calendar and a categorization of “good availability”, “little availability”, or “total scarcity”, food insecurity in our sample is widespread and follows a seasonal pattern. The greatest number of families experience total food scarcity for the month of October (40%), prior to the November/December harvests.

As evidenced by the incidence of food insecurity, this semi-subsistence farming system does not provide more than a means of survival. According to respondents, it provides little to no opportunity to save, invest, or build household wealth. The environmental conditions for production are marginal and carry high risk of loss due to the high incidence of droughts. In the summer of 2014, for example, in the midst of fieldwork for this study, the region was hit hard by a drought that affected most of Mesoamerica. Residents reported that those who had planted maize during the *primera* lost everything, and those who planted during the *postrera* also produced less maize than they had expected due to the lack of rains. In our survey, most families reported that over the last 5 years they had lost part of their harvests (77% of migrant families and 70% of non-migrant families), and almost a third reported they had lost entire harvests (32% of migrant families and 27% of non-migrant families). Drought was the most commonly reported problem leading to these losses. The climate conditions, which are worsening, thus translate through the semi-subsistence farming system into key factors for migration. Many identified the difficult environmental conditions as contributing to the need for labor migration: As one male informant, a university student with siblings in Spain and Costa Rica told us, “Cur-

rently, this is a dry zone. It’s practically telling us to “get out of here...” I think that if it weren’t for migration— the family members that are outside of the country in neighboring countries or [further away] it would be worse.”

In addition to an adverse climate, small farmers often find it difficult to obtain cash for inputs like fertilizers and pesticides, or sometimes cannot find desired inputs, like improved seeds, on the local market. Credit, to finance these inputs, although available privately, is expensive and perceived by smallholders as carrying a high risk of indebtedness. According to Roberto, a smallholder and former migrant to Costa Rica in his mid-forties,

...Micro-financers take advantage of producers; they say, “fine, I’ll lend you money but my policy is to have a high interest rate.” And so, because we need to work and progress (*desarrollar*), we’re at their mercy, with high interest rates, and a lot of times we become indebted... the producer is running the risk ...[and] it’s not certain that the harvest will be without issues because we have the problem of climate change, or too much rain, or too much drought...

These contemporary input and financing conditions are very different from the ones faced by Nicaraguan smallholders in the 1980s, when access to credit, inputs, and extension services was facilitated by the state (Deere & Marchetti, 1985). As reported by our respondents, the perceived high cost of credit, in terms of indebtedness risk and potential asset loss, shapes household decision making to search for an alternative to private credit for financing production. This search for the funds to purchase inputs leads many to labor migration.

Off-farm employment locally also does play an important role in household livelihood production. Sixty-three percent of all the surveyed households had one or more members reporting employment outside of their own farms, including regular self-employment in the informal sector. But for many, these jobs were on other farms, working as day labor harvesting sesame, for example. These agricultural day labor jobs may help households address constraints such as having access to very little land and credit that limits their ability to use all of their labor on their farm. However, this sort of diversification does little to spread the risk of drought. Failure of crops across the region leads to a lack of opportunity for this sort of day labor at the same time that a family’s own crops are impacted. In addition, these day labor opportunities are sparse

both inside and outside of the community and do not always generate cash income. For example, neighboring smallholders might ask for help in exchange for their own labor, food, or a space to plant maize. Roberto, the ex-migrant and smallholder introduced above, observed, “In the 80’s everyone had credit, if you needed a worker, you couldn’t find one. Today, there are too many, and many farm workers are unemployed. We don’t have the resources to hire them.” Sugar plantations are another source of employment in the region. Sugar plantations and factories are located about 60–90 km away from the study area. However, due to their distance and undesirability (participants cited the low pay and health hazards of working in the cane fields), very few community members take these jobs.

(iii) Land tenure and land access

As in most of Nicaragua, land distribution is highly skewed in Somotillo, and most of the arable land is again now in the hands of large landowners, as it was under the Somoza regime (Everingham, 2001). Historically, Somotillo was part of Nicaragua’s agricultural frontier. According to the elder participants in our study, the area was largely settled in the 1940s, when large tracts of land were available. Under the Somoza regime, most lands in Chinandega were held by Nicaragua’s elites in large estates (Everingham, 2001). During this time, many of our study participants’ families, who were landless, lived on these large estates, working for landowners and dedicating themselves to subsistence agriculture. After the Sandinista revolution in 1979, farms from the Somoza clan were converted into state farms and other lands were re-distributed to cooperatives (Zalkin, 1990). With the end of the Sandinista revolutionary government in 1990, conflicts over property provoked a process of parceling and land sales among the population of agrarian reform beneficiaries (Jonakin, 1996). Additionally, smallholders faced imperfect capital markets, which led to further land sales (Jonakin, 1996). In the study area, and across the country, this has led to the re-concentration of lands in the hands of few.

Several of our study participants referenced the re-concentration of lands in Somotillo in the hands of a few. As one male workshop participant summarized, the situation today is worse than before the revolution, “The large landholders (*terratenientes*) are back, but not like before. The ones who have land have taken all the land.” Land tenure is highly contested throughout Chinandega with multiple competing tenure claims under different and competing forms of documentation. These conflicts are ongoing, and their resolution is usually not in the favor of those with minimal political power. Broegaard (2009) provides an example from west of Somotillo, of ex-cooperative members who have had their lands taken away by politically well-connected individuals, including the former mayor of that particular municipality.

Our analysis of the survey data demonstrates uneven and inadequate land access in Somotillo, even within our sample, which we drew only from community residents (the largest landholding local elites do not reside in these communities). Inadequate access within the communities is particularly significant for livelihoods, since agriculture is the primary way families gain access to food and/or to income. Most households in these Somotillo communi-

ties do own at least some land (85% in our sample), but often only very small amounts (sample mean = 8 ha, range 0–84.5 ha). Many households also borrow land or rent land (43% in our sample) in order to supplement the small amounts owned (see Table 1). Only three households in our sample were not accessing land for carrying out agricultural activities—demonstrating the importance of land and agriculture to livelihoods. Most of the sampled households are accessing (including land rented and borrowed) less than four hectares, and those households which are the most “land poor” are the ones most likely to supplement their own land (or lack of land) by borrowing or renting very small parcels (Table 1). During the men’s workshop, one community member, who needs to rent to maintain semi-subsistence agriculture, explained it this way, “I have to rent because I only have the house where I live, and I need to sustain my family. For a time, I could work a little parcel they’d given my dad, but after that I’ve only rented.” In the context of our study, to “rent” encompasses a few different types of arrangements in which parts of the harvest, labor and/or money is exchanged for the seasonal use of land. The survey data indicate that many of the households in the second-to-lowest quintile are not in the same straits as the households in the lowest quintile due to better access to borrowed land (Table 1), often allowing them to avoid renting and to access slightly greater amounts. In general, however, those with the most land access tend to own it, while those with the least land access tend to rent it.

The qualitative data indicate the importance of seasonal and short-term migration to El Salvador to finance production, including land rental. To get the cash to rent, families send a member to work short-term across the border in El Salvador or elsewhere, where more rural labor opportunities exist. As one young mother with several family members abroad explained: “If a person doesn’t have land then he has to go [to El Salvador] to be able to pay the rent and buy his fertilizer and to be able to work...” As an older, male farmer explained,

Here, a producer thinks to himself, the agricultural cycle is coming. It starts in May, so he has to make money so he can invest it in his production. So, they earn money from two months of work and they come back to buy the fertilizer, the seeds—if he doesn’t have them, he buys them—and if he has no land he has to rent a piece. So then, you have to bring back money. This is the impact of migration. You leave to earn money so you can come back and resolve your problem at home. Since he has nothing, he has to leave.

Thus, the translation of climate through the farming system, with no state support, is only one component to understanding why people migrate for work. The other component is the land access and tenure system. The inequality of land access drives labor migration, as family members migrate in order to secure access to land.

(b) What are the resultant patterns of migration?

As outlined in the previous section, traditional semi-subsistence agricultural livelihoods are under increasing stress due to climate

Table 1
Land access for sampled households, divided into quintile rankings ($n = 120$)

Quintile rankings for land accessed	<i>n</i>	Av. land accessed (ha)	Range (ha)	Av. % land accessed that is owned (%)	Av. % land accessed that is borrowed (%)	Av. % land accessed that is rented (%)
Lowest quintile	24	0.7	0–1.4	36	8	43
Second lowest	24	1.9	1.4–2.5	48	28	25
Middle quintile	24	3.9	2.8–5.3	68	12	20
Second highest	24	7.3	5.3–10.6	90	9	1
Highest quintile	24	32.1	14.1–84.5	94	6	0

Table 2Destinations of Somotillo's International Labor Migrants ($n = 145^*$)

	El Salvador	Costa Rica	Guatemala	Spain	United States	Other**
<i>Current or most recent trip</i>						
Current migrants	9	43	3	4	17	5
Returned migrants	26	31	1	1	4	1
TOTAL	24% (35)	51% (74)	3% (4)	3% (5)	14% (21)	4% (6)
<i>First trip made</i>						
Current migrant	18	41	7	2	9	3
Returned migrants	34	26	0	0	3	2
TOTAL	36% (52)	46% (67)	5% (7)	1% (2)	8% (12)	3% (5)

* Data missing for one migrant of the 146 in the sample of 120 households.

** In most cases, "other" signifies Panama.

pressures, a land tenure regime that results in difficult access for many, and challenging economic and policy conditions for smallholder agricultural production. Our presentation of the following findings outlines how labor migration to neighboring countries emerges in the context of these pressures. Farmers in Somotillo are reconciled to a situation they see, in effect, as structural: As one producer and former labor migrant related, "Migration is permanent here because we don't have access to [paid] work. One way to soothe problems the family faces is through having a job. Another thing that helps us is to have access to credit in order to produce, but because we don't have these things most residents emigrate." In the 85 sampled households with migrants, 146 household members were (at the time of the survey) or had been (prior to the survey) outside of the country to find work. Based on categorizing all households (not just those surveyed) in each of the six communities as migrant or non-migrant, and whether any member of the household had ever undertaken international labor migration, we can approximate a household-scale migration rate for Somotillo: We observed that among the 1,097 families in the six sampled communities, 354 families had at least one member who was currently or had engaged in labor migration across international borders—a rate of 32%. Much of this migration is seasonal and/or short-term, and to the neighboring countries of El Salvador and Costa Rica (see Table 2). South-south migration accounts for the majority of international migration from the study area, for both men and women, with many fewer residents migrating to the United States or Spain. Costa Rica plays a large role in migration streams from Nicaragua, including for this region, but seasonal and short-term migration to El Salvador also plays an important role in our sample.

This type of south-south migration is attractive to Somotillo residents due to the proximity of these countries and the fact that border crossings require either the identification cards most people already possess, or also require relatively easily obtained visas. Indeed, El Salvador, a neighboring country close to Somotillo, is an attractive and important destination, as residents do not need a visa and can easily get a work permit and access networks established by migrants from their communities. This lowers risk considerably for the migrant. One male smallholder in his mid-30s, who is also a former migrant to Costa Rica, told us why people often prefer El Salvador over other destinations like Costa Rica or Panama, where wages are reportedly higher: "... It's easier [to go to El Salvador] because you spend less than you would going to Costa Rica, because to go there you have to pay for a visa and your passport, and to go to El Salvador you just pay for your ticket." The relative ease of migrating to El Salvador makes this an important destination for maintaining agricultural production.

(c) What are the outcomes of migration for smallholder families?

As discussed in 4(a), the primary purpose of labor migration from Somotillo is to earn cash. Earnings can be sent back to family

members as remittances, or can be carried home by the migrant on his/her return. Earnings are used for the purchase of food and other everyday needs, but earnings also are used to finance smallholder production. The household survey data demonstrate the financing of smallholder production as a key outcome of migration for many migrant families. Significant proportions of migrant households ($n = 85$) reported using migration earnings to buy inputs like fertilizer (38%), herbicides (38%), insecticides (21%), and farm labor (17%). Migrant households also reported renting land (29%). Thus our analyses of both the survey data and the qualitative data (see 4(a)) confirm the strong linkages between labor migration and the purchase of basic inputs to support smallholder production. An important point here is that the constraints (e.g., land and credit market access) introduced by the neoliberal economy lead many to see temporary labor migration as their only option for maintaining production—a production that is central to household food security since much of the food families eat is food they grow themselves or purchase from crop sales. In this way, labor migration becomes central to the reproduction of the smallholder farming system.

Fifty-five percent (66) of the surveyed households reported that they were currently receiving remittances. These families reported having used these funds to purchase a variety of goods, including agricultural assets, in addition to supporting everyday expenses for household reproduction and farming. Durable goods acquired through remittances included a vehicle (14%), a house (16%), large electric appliances (31%), and importantly, agricultural assets such as land (22%) and cattle (28%). If labor migration can result in an improved asset base for agricultural or other livelihoods and thereby increase livelihood options, labor migration potentially can reduce household vulnerability. However, the agricultural asset or household wealth accumulation in Somotillo linked to migration earnings is, for many, only on a small scale. The average reported most recent remittance was US\$142, with a range from US\$20 to US\$600,⁶ but respondents reported receiving remittances with varying frequencies (see Table 3). In addition, although some families reported receiving a remittance amount more than their monthly income from other sources, many families reported receiving a remittance amount less than the household's average monthly income (see Table 3). Even families receiving regular (monthly) remittances larger than the household's other monthly income are often receiving small amounts, given the very low local income streams.

Regardless of the potential benefits of migration earnings and their positive role in food production and security for some households with migrants, migrant households as a group are not much different overall from non-migrant households with respect to land accessed, nor do they disengage from subsistence production of maize and sorghum or cash crop production of sesame. Migration is also not without its disadvantages. While it begins to compen-

⁶ This mean excludes one household with an outlier reported remittance value of US\$2,000.

sate for systemic problems like lack of access to land, credit, and agricultural inputs, it does not come close to being a holistic strategy for addressing these problems. Other disadvantages to migration include the emotional strain placed on families due to prolonged family separation. A young woman who had taken over the leadership of her household when several family members, including her parents, left, expressed the sadness and difficulty she went through: “The hardest part is when they leave; when they leave, even though they’re helping us in some aspects, emotionally and psychologically it’s damaging to us. The departure of our loved ones that work far away is hard. Maybe the money can help us get over it—but no [it doesn’t].” These negative impacts of migration are well documented in the literature in migration studies, especially for south–north migration over lengthy periods (see, for example, [Torres & Carte, 2016](#)). Nevertheless, it is important to note that even south–south and relatively short-term migration generates its own negative impacts.

(d) Does migration function as climate change adaptation?

Can migration from Somotillo be characterized as adaptation to climate change? Our research demonstrates that the local climatic conditions for smallholder production are worsening. Local opportunities for and existing practices of adaptation to climate change occur within a complex system of political, economic, social and spatial factors ([Adger, Arnell, & Tompkins, 2005](#); [Howden et al., 2007](#); [Smit, Burton, Klein, & Wandel, 2000](#)). Our data show uneven access to land and inequality in land tenure and a reported lack of access to credit, similar to national findings a decade prior ([Boucher et al., 2005](#)). These persisting conditions for smallholder production strongly influence the contours of livelihood diversification and international labor migration. Our findings suggest that, in particular, the increasingly hotter and drier climate and the current land tenure regime (characterized by the difficulty of smallholder and landless access to sufficient and good farming land) co-produce labor migration. In this sense, the Nicaraguan state, through its agrarian policies, creates the need for smallholder migration in Somotillo through a policy-driven closure of alternatives.

A core problem of these agrarian policies is that they have focused on large-scale commercial, export agriculture. For smallholders, the emphasis has been almost exclusively on land titling, an agenda pushed since the early 1990s, which has not solved (or does not even intend to solve) land access for smallholders or landless but has consumed large amounts of resources ([Rueda Estrada, 2013](#)). The state otherwise could have invested these resources in more productive agricultural services for smallholders. Given this lack of state support, people migrate to neighboring countries like El Salvador because to many it appears to be their best option for maintaining their livelihoods in Somotillo, by making it possible for them to continue semi-subsistence farming.

Many families include the longer term labor migration of a family member to a country such as Costa Rica within their larger set of livelihood strategies. However, for other families, migration is

integrated into farming and is part of the farming cycle. For our interviewees, labor migration is necessary both in order to maintain subsistence production and to supplement meager or missing incomes. Earnings from taking short jobs outside Nicaragua allow families variously to expand access to land, sometimes buying, but more often only renting. These earnings also allow families to purchase other inputs for cultivation. Is this labor migration a kind of livelihood diversification? Throughout this article, we have on occasion framed it as such, at the same time that we have questioned the appropriateness of this conceptualization. In Somotillo, much of the international labor migration is an integral part of the contemporary smallholder farming system, allowing for the purchase of inputs and the rental of land. As such much of the migration we observe is not really diversification, as it only partly functions to spread risk given that much of the earnings go right into production. Instead, the labor migration functions to finance the current farming system, which in turn, largely maintains a steady-state smallholder production that remains highly vulnerable to climate change.

The framing of diversification as a positive adaptation to risk, through the spreading of risk, is deeply ingrained in the livelihood literature and has carried forward into the climate change adaptation literature. We have insufficient research weighing the benefits of risk-spreading through livelihood diversification against the potential for greater resilience from asset accumulation that might accrue from growing expertise and a deepening of networks that can accompany specialization. Disarticulated diversification, driven by diversification for its own sake in the absence of well-developed market linkages, similar to the “atomization” described by [Christman et al. \(2015\)](#) can result in labor efforts dissipating among numerous non-lucrative activities and may well not be associated with greater resilience. In research elsewhere in Nicaragua, [Bacon, Sundstrom, Stewart-Frey, and Beezer \(2015\)](#) examined the empirical relationship between different kinds of livelihood diversification and resilience, examining smallholder adaptive capacity in the face of several different environmental hazards. They found that not all diversification strategies assisted farmers in the ability to cope with environmental hazards and to moderate seasonal hunger. Strategies that directly increased access to food, such as growing food crops and planting fruit trees that provided subsistence products for their own consumption, were associated with fewer months of food insecurity, as were strategies such as off-farm employment that effectively increased cash resources. Other diversification strategies were not associated with fewer months of food insecurity.

Our data suggest that what is needed for climate change adaptation is longer term policy support with a consideration of the larger structural issues facing smallholders related to their power within markets. In addition, farmers would benefit very much from agricultural extension targeted to their specific agricultural needs and access to affordable and drought-resistant crop varieties, to facilitate yield increases. In sum, labor migration and the “failure” of sufficient in-place agricultural production reflects the lack of consistent, holistic state investment in smallholder agriculture;

Table 3
Remittances characteristics, households reporting currently receiving remittances

	Every 2 weeks	Monthly	Every 2–5 months	Every 6–11 months	Annually
Frequency received	20%	57%	20%	0%	3%
Average amount of last remittance received	US\$177	US\$153 ^a	US\$105	–	US\$35
For those receiving, last payment received was...			Less than	Equal to	More than
[less than/equal to/more than] usual amount received			38%	34%	28%
[less than/equal to/more than] household’s average monthly income			28%	8%	64%

^a One household with a reported remittance value of US\$2,000/month was excluded as an outlier.

highly unequal land access; as well as environmental conditions that do not allow for expanded cultivation efforts without supportive political-economic structures in place. From a research perspective, we need a more critical examination of diversification as adaptation to climate change, at the same time that we also need to more seriously incorporate analyses of political economy and power into livelihoods research (Scoones, 2009).

5. Conclusions

Returning to some of our initial questions, why do families in Somotillo engage in labor migration? Are they migrating in response to a changing climate? Is their migration best understood as climate change adaptation or not? Our main findings are that the changing climate, experienced through the smallholder farming system, and highly unequal land tenure co-produce labor migration. Labor migration finances the current farming system, maintaining a situation of smallholder production highly vulnerable to climate change. Labor migration is part of the smallholder farming system in Somotillo, arguably maintaining vulnerability and not contributing to resilience through livelihood diversification. We might now consider a further question: Is the labor migration that results from these conditions beneficial for smallholders? Labor migration is difficult, and many in the communities see it as socially costly for families and communities. Since it allows the current system to maintain itself for the moment at least, the possibility of international labor migration in effect exempts the Nicaraguan state from addressing deep structural issues of inequality within Nicaragua. It also shifts the burden for adaptation/coping directly onto the most marginalized in society—rural, peasant families. This inaction by the state occurs within the Nicaraguan sociopolitical climate of co-responsibility, which dovetails with a larger neoliberal discourse that assigns to individuals the responsibility for addressing their own vulnerability and poverty. For many families, labor migration barely allows for the maintenance of their semi-subsistence agricultural production. And therefore, perhaps most critically, it may actually reinforce existing social inequalities at various scales, locally through land access arrangements, and within the larger Nicaraguan polity through a persisting peasant sector characterized by food insecurity and deep poverty.

Finally, the reality of labor migration, land access, and agricultural production in Somotillo also requires us to consider more critically the intersections of agency and structure within the context of climate change adaptation. From a structural perspective, our findings demonstrate that household labor migration neither functions as adaptation to climate change nor reflects a failure to adapt, but rather reflects the weak position of smallholders in interlocking relations of power and the relative land scarcity experienced by many. However, it is also clear that labor migrants are exercising a circumscribed agency in their mobility strategies. Suggesting this migration is “forced” and that they are climate change refugees negates people’s active role in choosing how to respond to an untenable situation. Balancing these two insights can lead us to a more useful understanding of the relationship between international labor migration and climate change and climate change adaptation.

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